

Name: Key
A2CC Q4T2 Review

Date: _____

1. If $f(x) = 10\sin(2x) + 8$ then $f\left(\frac{\pi}{4}\right) = ?$

$$= 10\sin\left(2 \cdot \frac{\pi}{4}\right) + 8$$
$$= 10\sin\left(\frac{\pi}{2}\right) + 8$$
$$= 10 \cdot 1 + 8$$

(1) $4\sqrt{2}$

(3) 18

(2) 8

(4) $28\sqrt{3}$

2. Which of the following represents the range of the function $y = -6\sin(x) + 10$?

(1) $-60 \leq y \leq 60$

(3) $-16 \leq y \leq 4$

(2) $0 \leq y \leq 20$

(4) $4 \leq y \leq 16$

Amp is 6 $y=10$ is midline.

range is 6 above and below midline.

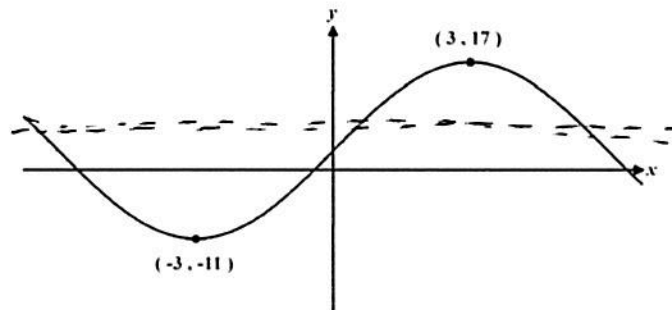
3. Given the sinusoidal graph with coordinates shown below, which of the following is the value of its amplitude?

(1) 14

(2) 6

(3) 12

(4) 28



$$\text{Amp} = \frac{17 - (-11)}{2}$$
$$= 14$$

4. A periodic function has an equation $y = 10\cos(8x) - 2$. What is the horizontal distance between any two consecutive relative maximums on this graph?

(1) 10

(3) 8

(2) $\frac{\pi}{2}$

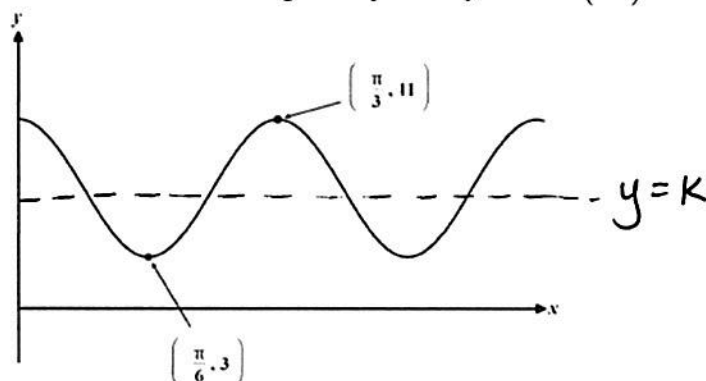
(4) $\frac{\pi}{4}$

freq = 8

per = $\frac{2\pi}{8}$

5. The graph shown below can be described using the equation $y = A \cos(Bx) + k$. Which of the following is the value of $B + k$?

- (1) 5π
 (2) 13
 (3) 11
 (4) $\frac{\pi}{7}$



$$K = \frac{11 + 3}{2} = 7$$

$$\text{per} = \frac{\pi}{3}$$

$$B = \frac{2\pi}{(\pi/3)} = 6$$

$$B + K = 13$$

6. Which of the following lines would the graph of $y = -5 \sin(x) + 14$ not intersect?

(1) $x = 0$

(3) $y = 20$

(2) $x = \pi$

(4) $y = 9$

Amp = 5
 range is 5 above and 5 below midline
 $[9, 19]$

7. A person riding a Ferris wheel at a local fair makes one complete trip around in 10 minutes. Their height can be modeled using a sine function of the form $y = A \sin(Bt) + C$, where t is the amount of time the person has been traveling, in minutes. Which of the following must be the value of B ?

(1) 10

(3) 10π

(2) $\frac{1}{20}$

(4) $\frac{\pi}{5}$

period
 $B = \frac{2\pi}{10}$

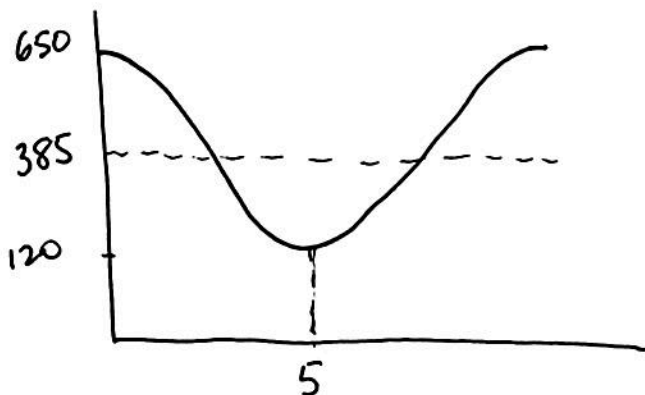
8. The volume of water in a tank varies periodically. At $t = 0$ it is at its maximum of 650 gallons and at $t = 5$ it is at its minimum of 120 gallons. Which of the following functions would best model the volume of water in this tank as a function of time in hours?

(1) $V = 265 \cos\left(\frac{2\pi}{10}t\right) + 385$

(2) $V = -770 \sin(10t) + 385$

(3) $V = -385 \cos(5t) + 265$

(4) $V = 265 \sin\left(\frac{\pi}{10}t\right) + 770$



$$\frac{650 + 120}{2} = 385$$

$$\text{per} = 10$$

$$B = \frac{2\pi}{10} = \frac{\pi}{5}$$

$$\text{Amp} = \frac{650 - 120}{2} = 265$$

9. If a distribution of sample means was created from a population, the standard deviation of this distribution would be

$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$$

- (1) equal to the standard deviation of the population
 (2) smaller than the standard deviation of the population
 (3) larger than the standard deviation of the population
 (4) equal to the standard deviation of the population divided by the size of the sample

10. If α is an angle drawn in the standard position with its terminal ray landing in the fourth quadrant and $\csc(\alpha) = -5$, then which of the following is the exact value of $\cos(\alpha)$?

$$\csc(\alpha) = -5$$

$$\sin(\alpha) = -\frac{1}{5}$$

(1) $-\frac{1}{5}$

(3) $\frac{\sqrt{24}}{5}$

$$\sin^2 \alpha + \cos^2 \alpha = 1$$

$$\left(-\frac{1}{5}\right)^2 + \cos^2 \alpha = 1$$

(2) $-\frac{24}{25}$

(4) $\frac{\sqrt{6}}{2}$

$$\frac{1}{25} + \cos^2 \alpha = 1$$

$$\cos^2 \alpha = \frac{24}{25}$$

$$\cos \alpha = \pm \frac{\sqrt{24}}{5}$$

4th quad. $\cos(\alpha) > 0$

11. For the angle θ it's known that $\cot(\theta) < 0$ and $\sin(\theta) > 0$. In which quadrant does the terminal ray of θ lie?

(1) I

(3) III

(2) II

(4) IV

12. In 2013, the mean gas mileage for cars was 27.6 miles per gallon. If the distribution of gas mileage in cars is normal with a standard deviation of 3.8 miles per gallon, then what percent of cars had gas mileages between 20 and 30 miles per gallon?

(1) 28%

(3) 71%

(2) 56%

(4) 98%

Same as #25

13. The gestation time (number of days before birth) for cows is normally distributed with a mean of 284 days and a standard deviation of 12 days. At a local ranch, over the course of a year there are 820 calf births. Of these, how many would be expected to have a gestation time less than 270 days?

- (1) 12 (3) 100
(2) 78 (4) 237

Same
as
26

14. For the function $f(x) = 6\sin(10x) + 8$, explain why the equation $f(x) = 0$ would fail to have any solutions.

Since $y = 8$ is midline and amplitude is 6, the range of $f(x)$ is $[2, 14]$ and therefore never $= 0$.

15. A value's percentile rank is the percent of a data set that lies at or below it. On a standardized test where the scores were normally distributed, Jeremy's score was 1.75 standard deviations above the mean. Which of the following is closest to his percentile rank?

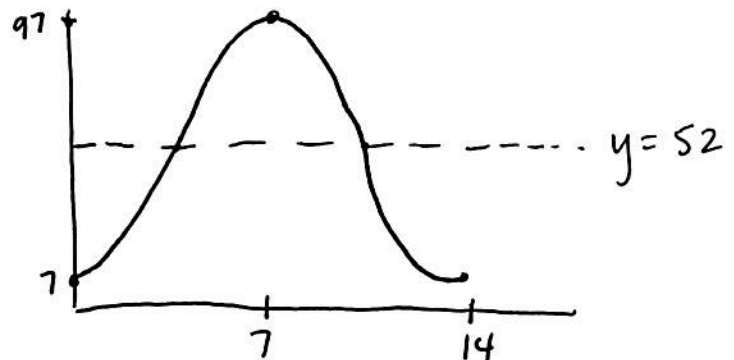
- (1) 54th (3) 83rd
(2) 67th (4) 96th

Same
as
27

16. A person's height, in feet above the ground, on a Ferris wheel can be modeled using the equation $h(t) = -45\cos\left(\frac{\pi t}{7}\right) + 52$, where t is the time the rider has been on the wheel in minutes. What is the maximum height the rider reaches and the time it takes to first reach this height if they get on at $t = 0$. Explain how you arrived at your answer.

$$\text{per} = \frac{2\pi}{(\frac{\pi}{7})} = 14$$

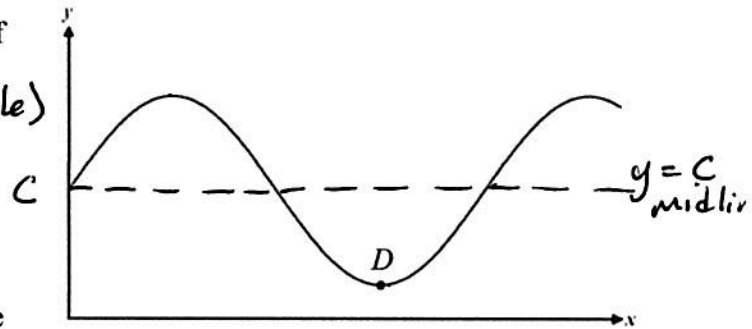
Max height = 97 ft.
First get to this height
in 7 minutes.



17. If the function $y = A \sin\left(\frac{\pi}{8}x\right) + C$ is graphed below, answer the following questions about point D marked.

- (a) What is the numerical value of the x-coordinate of point D ? Show how you arrived at your answer.

$\frac{3}{4}$ of the "way" through $\frac{1}{2}$ period (cycle)
 $\text{per} = \frac{2\pi}{\pi/8} = 16$
 $X = \frac{3}{4} \cdot 16 = 12$



- (b) What is the y-coordinate of D in terms of the constants A and C ?

$y = C - |A|$ or $C - A$ since A is pos. here

18. The graph shown below can be modeled using the equation $y = A \cos(Bx) + C$. Determine the values of A , B , and C . Show how you arrived at your results.

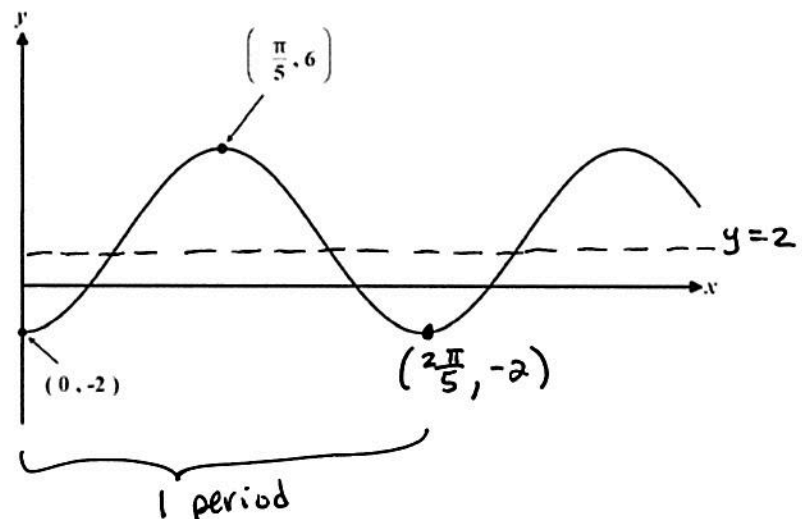
$\text{Amp} = \frac{\text{Max} - \text{Min}}{2} = \frac{6 - (-2)}{2} = 4$

$A = -4$ ("negative" cosine graph)

(midline) $C = \frac{\text{Max} + \text{Min}}{2} = \frac{6 + (-2)}{2} = 2$

$\text{per} = \frac{2\pi}{5}$

$B = \frac{2\pi}{(2\pi/5)} = 5$



19. Subjects in a sleep study are separated by age into two groups. This separation is done to observe which of the following types of variability?

- (1) Measurement (3) Induced
 (2) Natural (4) Sample

Since the subjects are placed into two groups based on a distinguishing characteristics (age), this serves to observe induced variability.

20. In which of the following cases would a survey be more appropriate than an experimental study?

- (1) A study to determine how age affects the number of hours of sleep a person gets.
 (2) A study to determine the most popular show on television on a given night.
 (3) A study to determine the commute time to work based on geographic location.
 (4) A study to determine if a particular drug lowers cholesterol.

In Choice (2) there is no induced variability, only variability due to the sample taken for the survey.

21. On the first day of a small local fair, 55 children, 20 adults, and 25 senior citizens were admitted. If children's tickets cost \$5.00 each, adult tickets cost \$8.00 each and senior citizen tickets cost \$6.00 each, what was the mean ticket price for all 100 people who entered?

(1) \$6.35

(3) \$5.85

(2) \$5.20

(4) \$6.33

$$\frac{55(5) + 20(8) + 25(6)}{55 + 20 + 25}$$

22. In which of the following situations is a survey least likely to contain bias?

(1) surveying a sample of people leaving a concert about their favorite musicians

(2) surveying the members of a basketball team to determine the average height of high school boys

(3) surveying people leaving a grocery store about their political party affiliation

(4) surveying teenagers who use social networking websites about their favorite communication methods

← Presumably, all political affiliations shop in a grocery store. So, it is most like a random sample than any of the other choices.

23. Students did poorly on a recent test, so their teacher decided to add 6 points to each student's grade. Which of the following statistical measures would not be affected by the addition of these points?

(1) the mean score

(3) the median score

(2) the first quartile

(4) the standard deviation of the scores

The entire dist is translated to the right. The spread is unchanged.

24. In a survey of 236 freshmen, it was found that 151 of them owned cell phones. Which of the following is closest to the proportion of freshmen who do not own cell phones?

(1) 0.21

(3) 0.43

(2) 0.36

(4) 0.64

$$\hat{p} = \frac{236 - 151}{236}$$

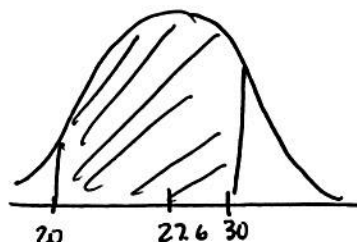
25. In 2013, the mean gas mileage for cars was 27.6 miles per gallon. If the distribution of gas mileage in cars is normal with a standard deviation of 3.8 miles per gallon, then what percent of cars had gas mileages between 20 and 30 miles per gallon?

(1) 28%

(3) 71%

(2) 56%

(4) 98%



$$\mu = 27.6$$

$$\sigma = 3.8$$

26. The gestation time (number of days before birth) for cows is normally distributed with a mean of 284 days and a standard deviation of 12 days. At a local ranch, over the course of a year there are 820 calf births. Of these, how many would be expected to have a gestation time less than 270 days?

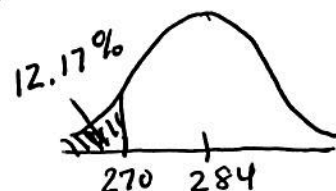
(1) 12

(3) 100

(2) 78

(4) 237

12.17% of 820



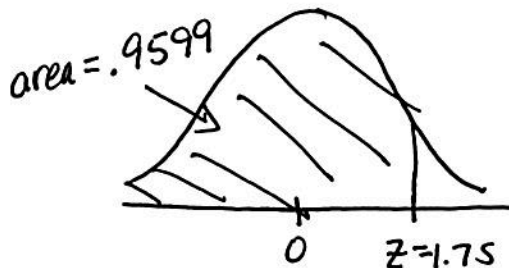
27. A value's percentile rank is the percent of a data set that lies at or below it. On a standardized test where the scores were normally distributed, Jeremy's score was 1.75 standard deviations above the mean. Which of the following is closest to his percentile rank?

(1) 54th

(3) 83rd

(2) 67th

(4) 96th



28. Mr. Richmond's traffic engineering class is trying to determine people's attitudes towards their evening commute. Students in his class decide to stop drivers on their way home to conduct this survey. Why would this survey method introduce bias into their results?

This is not a random sample in which each member of the population has an equal chance of being selected.

29. At a local PTA meeting, a sample of parents were surveyed to determine how many children they currently had attending school. Their results are shown in the frequency table below:

Determine the mean, median, and standard deviation for this sample. Round any non-integer answers to the nearest tenth.

mean = 2.3

median = 2

Std dev = 1.4

Determine how many of the 55 families surveyed have a number of children that was within one standard deviation of the mean. Show your analysis.

$(2.3 - 1.4, 2.3 + 1.4)$

$(.9, 3.7)$

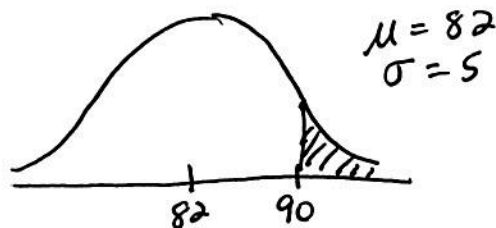
48 families are within one std dev.

| Number of Children | Number of Families |
|--------------------|--------------------|
| 1 | 16 |
| 2 | 24 |
| 3 | 8 |
| 4 | 3 |
| 5 | 2 |
| 7 | 2 |

30. The scores on a standardized test that Jeremy took were normally distributed with a mean of 82 and a standard deviation of 5. On the test, Jeremy scored a 90.

(a) What percent of students scored better than Jeremy on this test? Round to the nearest tenth of a percent.

5.5%



- (b) If Lisa took the same test, at a different time, and the scores were again normally distributed with a mean now of 83 and a standard deviation of 6.4, then what score, to the nearest integer, would make her percentile rank the same as Jeremy's? Show how you arrived at your answer.

$$z = \frac{x - \mu}{\sigma} \quad \frac{90 - 82}{5} = 1.6$$

$$1.6 = \frac{x - 83}{6.4}$$

$$x = 93.24$$

She needs
a 93

31. Water is flowing out of a reservoir such that the depth of the water is a decreasing function of the number of hours since water was released. Engineers measure the depth of the water and their results are shown in the table below.

| | | | | | |
|-----------------------------|------|------|------|------|------|
| Time, x (hours) | 2 | 4 | 8 | 14 | 20 |
| Depth of Water, y (ft) | 44.7 | 36.8 | 29.2 | 22.3 | 15.1 |

- (a) Find an exponential equation, of the form $y = a(b)^x$, that best fits this data set. Round your coefficients to the nearest *hundredth*. Then, use your equation to predict the depth of water after 2 days have elapsed. Round your depth to the nearest *tenth* of a foot.

$x = 48$ hours

$$y = (47.97)(.94)^x$$

$$y = 2.46097$$

2.5 ft

- (b) How would you characterize the strength of the exponential correlation between the two variables? Explain.

32. A population that is normally distributed has a mean of 164 and standard deviation of 18.65. If a sample of size 50 was taken from this population, what is the probability its mean would be greater than 168? Show how you arrived at your answer. Round to the nearest tenth of a percent.

$n = 50$

$$P(\bar{x} > 168) = .06469$$

6.5%

$$\mu = 164$$

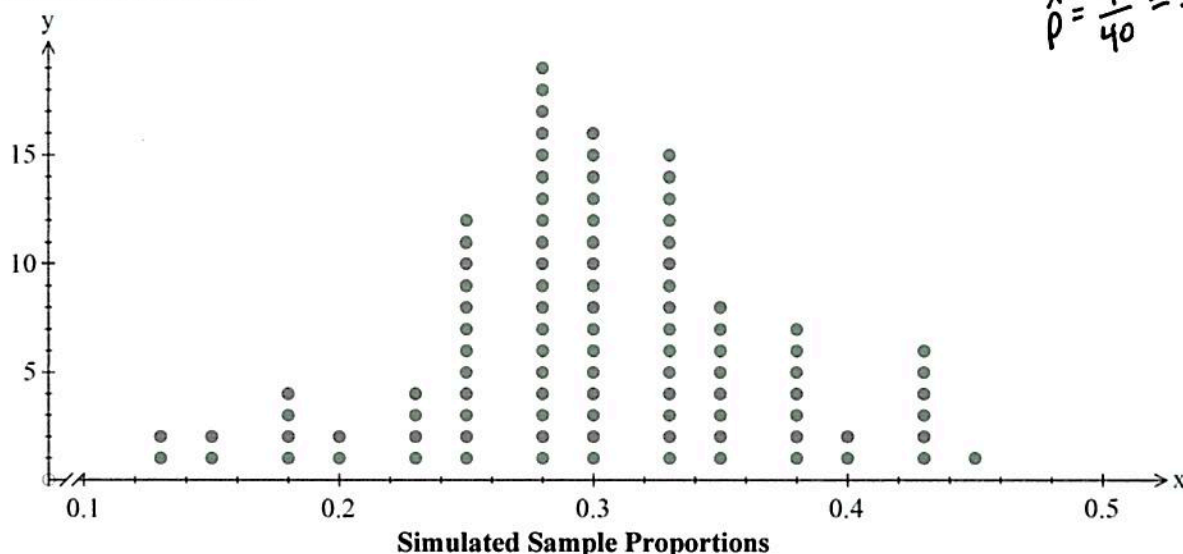
$$\sigma_{\bar{x}} = \frac{18.65}{\sqrt{50}}$$



33. In a recent survey of 500 people, 45% of them reported that they were going to vote for Candidate A in an upcoming election. If the survey was reported to have a margin of error of 2%, explain what this means in terms of the actual support for Candidate A.

same as
36

34. A survey of 40 high school students was done to determine how many of them liked fresh fruit for lunch. The school will offer a fresh fruit option if more than 30% of students like fruit. Of the 40 surveyed, only 9 of them stated that they liked fruit with lunch. Simulations were done with a population proportion of 0.3 and a sample size of 40 to see how likely a sample of 40 would have only 9 who liked fruit. The results of 100 simulations are shown below.



$$\hat{p} = \frac{9}{40} = .225$$

(a) What was the observed sample proportion for this survey? Round to the nearest hundredth.

$$\hat{p} = \frac{9}{40} = .225$$

.23

(b) If the true population proportion is 0.30, then how likely is it, based on this simulation, that a sample of size 40 would have 9 or fewer students say they like fruit for lunch?

Approx 10% of simulations have fewer than 9 students.

(c) Based on this survey, should the school conclude that they should not serve fruit for lunch? Explain your reasoning.

No. A result this low will happen 10% of the time just by chance.

35. Environmental engineers are trying to determine the characteristic fuel economy of cars on the road today. They surveyed 250 drivers about their cars and found the following distribution of fuel efficiencies as rated by the miles per gallon that a given car used while driving on the highway.

Find the mean and standard deviation for this sample of cars. Round both answers to the nearest *hundredth* of a mile per gallon.

$$\bar{x} = 24.03$$

$$s = 5.39$$

Determine the percent of these cars that fall within one standard deviation of the mean.

$$(\bar{x} - s, \bar{x} + s)$$

$$(18.64, 29.42)$$

185 cars

$\sim 79\%$

| Fuel Efficiency (mpg) | Number of Cars |
|-----------------------|----------------|
| 12 | 2 |
| 16 | 5 |
| 18 | 20 |
| 19 | 35 |
| 22 | 68 |
| 26 | 52 |
| 29 | 30 |
| 32 | 18 |
| 45 | 5 |

Would this sample be well modeled by a normal distribution? Explain your response.

More than two percent ^(5 cars) of the sample lies approx 4 standard deviations to the right of the mean. Extremely unlikely. Along with a much higher % within one std dev., a normal dist is not the best for this data.

235 total

36. In a recent survey of 500 people, 45% of them reported that they were going to vote for Candidate A in an upcoming election. If the survey was reported to have a margin of error of 2%, explain what this means in terms of the actual support for Candidate A.

The true percent of ppl favoring cand. date A can be (expected to be) between 43% and 47%.